

The Arcnet Alternative: Nestar's Plan 4000

The Arcnet system features a gigantic capacity for memory and can stretch the idea of local area networks several miles further.

Plan 4000 Network
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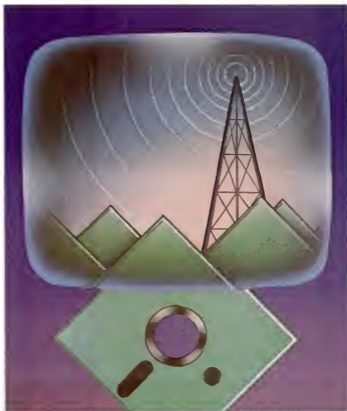
List Price: PC network interface card \$595,
line isolation device \$1,900; price of net-
work server depends on configuration.

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net will become the next local area net-
work standard, Nestar Systems Incorpo-

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rated looked at Arcnet and saw a superior candidate for the job. So Nestar chose Arcnet as the standard for its new Plan 4000 networking system.

Arcnet was originally developed by Datapoint as a proprietary network for its own line of office products. Datapoint entered Arcnet in the network standards race in 1981 when the company declared



that the network was no longer proprietary. After that declaration, any company could freely incorporate Arcnet into its own products. Despite its quiet beginning, the network has a number of factors that make it a worthy contender for the network standards title.

Arcnet is very likely the most popular system now used in more than 5,000 separate office networks throughout the world. One reason for its popularity is the head start Arcnet had over its competitors; Datapoint started shipping Arcnet in 1977. (Ethernet wasn't officially announced until 1980, and its hardware didn't appear until 1981.) A major expansion of Arcnet's user base came last year when Tandy Corporation announced that it had adopted Arcnet for its Radio Shack Model II and 18 computers.

That head start endowed Arcnet with several significant advantages. Because the system has been in use for so long, all its subtleties are well understood, and the bugs have been thoroughly shaken out. Integrated circuit controller chips for Arcnet have been available for a year, greatly reducing the cost of network hardware.

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Arguments will continue to whirl concerning the respective merits of Ethernet versus Arcnet, particularly over the question of transmission speed. Arcnet uses a token-passing system that runs at 2.5 million bits per second, while Ethernet uses a scheme that goes by the tongue twisting name carrier sense multiple access with collision detection (abbreviated CSMA/CD), and runs at 10 million bits per second. These figures, however, represent theoretical maximum data rates, not the effective data rates. Due to factors arising from the intricacies of each installation, the effective data rate on Arcnet possibly could be higher than Ethernet, which has a higher ideal maximum data rate.

Despite the obvious differences between Arcnet and Ethernet at the hardware level, Nestar's Plan 4000 offers an unexpected feature. Though it is an Arcnet network, it is entirely compatible with Ethernet's upper level software, such as applications programs. (Standards for networks are set for seven different levels, or layers, by the International Standards Organization.)

Vast Networks

When Nestar Systems Corporation builds a network, it doesn't fool around. The Winchester disk capacity supplied with the company's new Plan 4000 network starts at 60 megabytes, and increases to well over half a gigabyte, 548 million bytes to be exact. Why such voluminous storage capacity on a network designed for microcomputers?

"We have been in the network business for over 3 years," explains Peter Hertan, vice president of marketing at Nestar, "and we know the needs of our users." Hertan feels that companies incorporating only 5- and 10-megabyte Winchester in their network file servers are lulling their users into a false sense of security. According to Hertan, the file server will have to be fairly large; with the price of Winchesters dropping, more users will be running a 5- or 10-megabyte Winchester local to their PCs.

A file server of half a billion bytes implies the ability to service a large network. Buyers of Nestar's Plan 4000 will not be disappointed in this respect. The network was designed to support up to 255 stations without significant degradation in response time. Those stations may be any combination of IBM PC, Apple II, Apple III, Datapoint, or Radio Shack Models II or 18—an assortment that Hertan believes should please a lot of users.

The Four Mile Run

A close look at some of the specifications of Nestar's Plan 4000 reveals that it looks like a remote area network, though it is called a local area network. This is because the maximum distance between any two nodes on the network can be as much as 4 miles.

The concept of a node does not explicitly appear in Ethernet, which instead makes a simple T-connection between the network cable and the station. Arcnet uses

a more complex node scheme in which each station connects to the cable through a black box called a line isolation device (LID). A LID has provisions for up to ten connections, nine to individual stations and one to the next LID, or ten to individual stations if the LID is at the end of a chain in the network. Each LID with its associated stations is referred to as a net-

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work node. If you could look down at the layout of stations attached to an Arcnet, you would see something like a series of starbursts, with each star corresponding to a node. In Nestar's Plan 4000, the network server itself contains an internal LID with connections for up to 30 stations. To add more stations, additional LIDs are placed on the network wherever they are needed.

Although they add a certain amount of cost and complexity, the LIDs perform two important functions. First, they electrically isolate stations on the node from each other, so that a problem with one station does not disrupt the network. (Ethernet deals with this problem through the design of its transceivers.) Second, each LID reconditions the signal it receives from the Arcnet cable, so that the signal leaving a LID is actually better than the signal coming into the LID from the network cable. This is in large measure why the links in Arcnet can stretch for over 4 miles.

To plug into a Plan 4000 network, a single interface card is inserted into any PC expansion slot, and a cable from the network is plugged into the card via a back-panel connector. Nestar's PC network interface card is \$95. When the additional cost of a LID is figured in—at \$1,900 per LID, the cost per station on a ten-station node is \$190—the direct cost per terminal to connect to Plan 4000 is under \$800. That \$800 figure, however, doesn't take into account the cost of the network server. Unlike 3Com's EtherSeries, Nestar's Plan

4000 cannot be configured without a network server.

Refined Software

Nestar's objective is to sell Plan 4000 mostly to larger firms; it has targeted the Fortune 2000 companies as its primary market. According to Hertan, the network is available from Nestar only in configurations suitable to several stations. Hertan expects other companies to make smaller

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configurations available at a later date. A typical Plan 4000 configuration consists of a 137-megabyte hard disk backed up by a 45-megabyte streaming tape drive, and costs about \$24,000. Those are pretty big bucks, and for that price you would ask such a system to offer many sophisticated features.

Plan 4000 is up to the challenge. Seven server routines, ranging from file and print servers to emulators and telex servers, are already available. This extensive software support is a legacy of Nestar's ongoing experience in selling networks. Most of the server routines are virtual copies of programs that have already proven their reliability in other Nestar networks.

The file server, the workhorse of any network, is a good example of the extent and refinement of features implemented by Nestar. Nestar's file server functions transparently; standard PC-DOS commands access resources from across the network as easily as they access local resources. File servers will initially support both IBM's PC-DOS and the UCSD p-System, with support to be introduced later for CP/M-86. The early and unexpected availability of support for the p-System is a byproduct of Nestar's having written its server software in Pascal. The easy portability of the software from earlier networks to the new system can also be attrib-

uted to Nestar's foresight in using a portable language like Pascal.

Nestar's file server allows the PC user to establish virtual disks, or volumes, of any size on the Winchester. Virtual disk size is limited only by PC-DOS. Once a file is established, it can be protected at two levels. First, the user can define password protection that governs access according to three user categories: public, group, or private. Two different passwords can be defined per volume. For each password, five different access functions—read, write, erase, create, and delete—can be specified.

In case this is not enough protection, the file server also provides a "lock manager," which can be used in applications that need to restrict access to resources such as fields in a data base. Using the lock manager, the user can subdivide the files into fields as small as desired. Database systems that allow concurrent access by several users need a facility like the lock manager to prevent the corruption of data that could occur, for example, when one user is reading data that another user is in the process of altering. The file server also supports multiple disks, tape backup, and automatic error detection and recovery.

Closely allied with the file server is the file transfer server, a facility that allows stations on one network to send files to another network or stand-alone PC via telephone lines. The transfer server allows unattended dial-in and dial-out, while automatically logging all activity.

Talking to Other Networks

Communicating with a network via phone lines is efficient, except when the traffic volume is high. For increasing efficiency in high-volume situations, Nestar offers a "gateway server," a facility that interconnects networks at the full network data rate. This is the point at which Plan 4000's software compatibility with Ethernet comes into play. An Ethernet and a Plan 4000 network could be interconnected via a gateway server. "With the software compatibility already established, that gateway is just a matter of a card or two, a trivial piece of hardware to build," Hertan says, adding that Nestar will offer a gateway to Ethernet.

Plan 4000's print server is as refined as its other features, offering spooling and other services reminiscent of mainframes.

The user can, for example, attach a scheduling priority of high, standard, low, or overnight to the print job, and later query the printer as to the status of the print requests. Although the print server requires a dedicated PC, Plan 4000 supports the suspension of printing, which means a user can do other tasks on a print-dedicated PC at any time. When the user relinquishes the machine, printing will resume exactly where it left off. A single dedicated print server can support multiple printers.

Nestar believes that a large proportion of its networks will be sold to customers having access to mainframes; in many cases, their large computers will be IBMs. For those customers, Nestar has two additional servers: a 3270 emulator that transforms any networked PC into a virtual IBM 3270 terminal, and a 3780 emulator. The 3780 is a combination card reader, printer, and card punch for remote job entry to IBM mainframes. 3270 emulation can be very economical. It allows multiple stations to use a single modem, and ties up only one port on the mainframe.

Nestar offers training classes for both advanced users and system maintenance personnel to help them navigate through the intricacies of its high-powered Plan 4000. The company is also making a library of software modules available to users for customizing the network to specific applications.

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Ethernet has made a strong bid to become the prevailing network standard, but the race is still on. Nestar has clearly done its homework in designing the Plan 4000; the company's decision to go with Arcnet hardware, rather than Ethernet, was based on a careful analysis of what each network has to offer. By combining Arcnet hardware with Ethernet-compatible software, Nestar has created a system that may offer the best of both worlds. /PC